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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/909,993	07/23/2001	Susan Davis Allen	FSU-0003	1378

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EXAMINER	
WINTER, GENTLE E	

ART UNIT	PAPER NUMBER
1746	

DATE MAILED: 05/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/909,993	ALLEN, SUSAN DAVIS	
	Examiner	Art Unit	
	Gentle E. Winter	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3/9/04*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15,17-37 and 66* is/are pending in the application.

4a) Of the above claim(s) *4,5,7,12,13,19 and 21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-3, 6, 8-11, 14-18, 20, 22-37 and 66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Remarks

1. The remarks indicate that Applicant has discovered, as evidenced in the present application, that by selecting laser energy transfer parameters and a composition, thickness, and geometry of an energy transfer medium based on a composition of the one or more particles to be removed and a composition of the substrate, the energy deposition into at least the energy transfer medium can be controlled so as to remove the one or more particles from the surface while minimizing damage to the substrate. Selecting the composition of energy transfer medium includes, for example, selecting the components of the energy transfer medium to produce desired optical, chemical and thermophysical properties. The arguments are not persuasive. The specific remarks to claim 32 rely on the arguments from the independent claims and do not argue motivation or secondary characteristics. The added claim limitations are present in Tam, thickness and geometry are present in all energy transfer mediums. No criteria is disclosed. Minimizing damage to substrate, is vague, what additional step is contemplated by "minimizing damage"?

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claim 1-3, 6, 8-11, 14-18, 20, 22-37 and 66 are rejected under 35 U.S.C. 102(b) as being anticipated by the reference: J. Appl. Phys., Vol 71, No. 7, 1 April 1992, to Tam et al. Hereinafter (RR, corresponding to its IDS reference identifier).

2. Claim 1 is anticipated as follows; claim 1 discloses a method of removing one or more particle(s) adhered to a surface of a substrate, (see figure 1, showing particles adhered to the surface) comprising: selecting laser energy transfer parameters (see figure 2 showing pulsed laser irradiation) and a composition of an energy transfer medium (figure 3 showing a water film) based on a composition of the one or more particle(s) to be removed and a composition of the substrate (see figure 2 showing alternatively strong substrate or particle absorption); arranging an energy transfer medium having said composition under and around the one or more particle(s) to be removed (see figure 3); and irradiating at least said energy transfer medium with laser energy having said selected laser energy transfer parameters (figure 3 discloses 3 embodiments: strong substrate absorption; some energy transfer absorption and some substrate absorption; and strong energy transfer absorption), wherein said laser energy transfer parameters and the composition of the energy transfer medium were selected to effect removal of the one or more particle(s) from the surface. (Page 3518 discloses optimizing cleaning parameters).

3. As to claim 2, disclosing that the step of arranging an energy transfer medium under and around the one or more particle(s) to be removed and the surface comprises adsorbing an energy transfer medium under and around the one or more particle(s) to be removed, the same is illustrated in figure 3. See also section 2 at page 3520.

4. As to claim 3, 8, 9 and 10 disclosing that the laser energy transfer parameters comprise the wavelength of the laser energy (figure 3 disclosing 248 nm and 10.6 micron wavelength), the density of the laser energy, the pulse length and shape of the laser energy, the pulse repetition rate of the laser energy, and the laser beam size and/or shape, and the irradiation geometry of the particle(s)/substrate/energy transfer medium. It is not clear that these parameters are being adjusted or are being recited as simply having a value. Inherently all of the indicated parameters have values, and the adjustment of the wavelength will impact energy density. As far as beam size and shape since the beam will have a size and shape, and is disclosed to have a pulse repetition rate. Figure 4 and relevant associated text details the use of a Moly mask for the laser and various other beam property control elements. The temperature where the cleaning is performed is the ambient.

5. As to claim 6, disclosing that the step of selecting the laser energy transfer parameters comprises selecting the pulse length and shape of the laser energy. Again the pulse length and shape is disclosed is discussed *inter alia* at page 3518 under heading 1 and illustrated in figure 3, while control systems are illustrated in figure 4.

6. As to claims 14, disclosing that the composition of the energy transfer medium is selected such that it will couple efficiently with the laser energy of the laser. See section 1 at page 3518 second column. Disclosing experimenting with different solvents in order to ascertain which liquid works best. Figure 3 illustrates different coupling scenarios.

7. As to claim 15, disclosing that the step of selecting the laser energy transfer parameters and the composition of the energy transfer medium comprises selecting at least one of the wavelength of the laser energy, the density of the laser energy, the pulse length and shape of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, and/or the ambient conditions. The wavelength is disclosed in figure 3 and relevant associated text.

8. As to claim 16, further limiting claim 15, and disclosing that wherein the step of selecting the laser energy transfer parameters and the composition of the energy transfer medium further comprises selecting the amount and disposition, and the composition of the energy transfer medium. The differing compositions are discussed at page 3518 second column. As to the amount the same is indicated at figure 3 and relevant associated text.

9. As to claim 17, disclosing further limiting claim 16, and disclosing that the laser wavelength of the laser energy, the density of the laser energy, the pulse length and shape of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, the ambient conditions, the amount and disposition of the energy transfer medium, and/or the composition of the energy transfer medium are selected based on application and environment. The composition is disclosed to be a variable that is case dependant.

10. As to claim 18, disclosing that the laser energy is sufficient to be absorbed by the energy transfer medium, either directly or by conduction from the substrate. This illustrated in figure 3, and discussed in the relevant associated text.

11. As to claim 20, further limiting claim 6 and disclosing that the pulse length of the laser energy is sufficiently short in order to achieve a desired temperature distribution of the energy transfer medium. Figure 3 (b) illustrates this concept. In a larger sense since "desired" is not defined and seemingly any duration would seemingly be satisfactory for an anticipatory rejection.

12. As to claim 22, further limiting claim 8, and disclosing that the laser beam size and/or shape is selected to clean as large a surface area as possible. The Moly mask and optics of figure 4 meet this limitation. Again applicant uses vague subjective words "as large a surface area as possible" It simply is not clear exactly what is intended by "possible". Presumably there is no theoretical upper limit to the size of a laser beam.

13. As to claim 23, disclosing that the energy transfer medium is a uniform layer of thickness, adsorbed under and around the one or more particle(s) to be removed, or a combination thereof. Again figure 3 and relevant associated text and the disclosure starting at page 3520.

14. As to claim 24, further limiting claim 23 and disclosing that the energy transfer medium is a uniform layer of thickness. This is illustrated in figure 3. it is also not clear that applicant envisions a system where the energy transfer medium is not of uniform thickness. Applicant is requested to provide clarification as to how the invention would work with a non-uniform coating.

15. As to claim 25, further limiting claim 23, and disclosing that the energy transfer medium is adsorbed under and around the one or more particle(s) to be removed, see figure 3 and relevant associated text and text beginning at page 3520.

16. As to claim 26, disclosing that the energy transfer medium comprises a condensable material that is strongly absorbing at the selected wavelength. Water is disclosed, as discussed above, and water meets the limitations.

17. As to claim 27, disclosing that the energy transfer material comprises an azeotrope. Alcohol and water are disclosed and from an azeotrope see 3518 column 2, line.

18. As to claims 28 and 29, disclosing that the energy transfer material comprises a constant composition non-azeotropic doser. While the same is believed to be disclosed in figure 4 and pages 3518 second column and 3519 first column. It is not clear how a composition includes a doser. The specification does not further clarify the issue and applicant is cordially requested to

provide clarification as to exactly what is contemplated by "doser". Paragraph 93 of the specification appears to reference dosers.

19. As to claim 30, disclosing that the step of irradiating at least the energy transfer medium with laser energy comprises irradiating a surface of the substrate opposite to the surface containing the energy transfer medium. The radiation is understood to pass through the substrate thus irradiating both the front and the back of the substrate.

20. As to claim 31, disclosing that the method according to claim 1, wherein the substrate comprises a nonabsorbing material, and the energy transfer medium comprises an absorbing mixture. The same is disclosed in figure 3 and relevant associated text. The substrate is disclosed as being a silicon wafer at page 3519 first column especially second paragraph.

21. As to claim 33, disclosing a method of removing one or more particle(s) adhered to a surface of a substrate, comprising: adsorbing an energy transfer medium under and around the one or more particle(s) to be removed (see figure 3 and relevant associated text and page 3520); irradiating the one or more particle(s), the substrate, the energy transfer medium, (figure 3); and selecting two or more of the laser wavelength of the laser energy, the pulse length and shape of the laser energy, the density of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, the ambient conditions, an amount and disposition of the energy transfer medium, and a composition of the energy transfer medium to precisely control an energy deposition into the one or more particle(s), the substrate, the energy

transfer medium or a combination thereof; and absorbing sufficient energy in the particle(s), the substrate, the energy transfer medium, or a combination thereof to dislodge the one or more particle(s) from the surface. See e.g. page 3519 describing the set-up, see also figure 4.

22. As to claim 34, that two or more of the laser wavelength of the laser energy, the pulse length and shape of the laser energy, the density of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, the ambient conditions, the amount and disposition of the energy transfer medium, and the composition of the energy transfer medium are selected based on application and environment to precisely control an energy deposition into the one or more particle(s), the substrate, the energy transfer medium, or a combination thereof. Beam fluence is disclosed on page 3519, as is number of pulses and wavelength.

23. As to claims 35 and 36 disclosing a method of removing one or more particle(s) from a surface of a sample, comprising: selecting an optical radiation source having an optical energy distribution; (KrF laser) determining a tailored composition to serve as an energy transfer medium for said optical radiation source having said optical energy distribution (see second column of 3519 discussing parameters in tailoring the composition); and determining a tailored optical pulse of said optical radiation source in view of said composition distribution (see second column of 3519 discussing parameters in tailoring the composition). Wherein when said energy transfer medium is arranged on the surface of the sample having the one or more particle(s) and is subsequently irradiated by said optical radiation source, sufficient energy is transferred from

the tailored optical pulse to said one or more particle(s) via the energy transfer medium to dislodge said one or more particle(s) from the surface. See figure 5 and relevant associated text.

24. As to claim 37, disclosing a method of removing one or more particle(s) from a surface of a sample, comprising arranging an energy transfer medium on a surface of a sample; (see figure 4 and relevant associated text), irradiating said energy transfer medium with a tailored optical radiation pulse, whereby energy from said tailored optical radiation pulse is absorbed largely by said energy transfer medium but not significantly by the sample causing the one or more particle(s) to be removed from the surface. See figure 3a and relevant associated text.

25. As to claim 66, disclosing a method of comprising: selecting laser energy transfer parameters and a composition, thickness, and geometry of the energy transfer medium based on the particles and substrate combination*; arranging the energy transfer medium under and around the one or more particles to be removed (see figures 2 and 3) to yield particle, substrate and energy transfer medium combination. Determining laser energy transfer parameters based on the particle, substrate and energy transfer medium combination to yield controlled energy deposition into at least said energy transfer medium. See figure 1 and relevant associated text. Irradiating at least said energy transfer medium with said laser energy having said selected laser energy transfer parameters to effect controlled energy deposition into at least said energy transfer medium (see figure 3 and relevant associated text.). Wherein said controlled energy deposition removes the particles from the surface while minimizing damage to the substrate. The same is

* The "/" has been construed as the conjunctive "and" not the disjunctive "or".

identically disclosed in figure 3 and relevant associated text. See especially 3518 et seq. It is noted that he preamble is given little patentable weight, the claim is understood to be drawn to a method of cleaning. Applicant is cordially requested to provide clarification as to whether the claim is intended to be drawn to a method of cleaning or to a method of depositing energy.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

26. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,130,195 to Doyel et al. (Doyel).

27. Each and every limitation of claim 32 is disclosed in RR as set forth above, except that RR fails to explicitly disclose that the energy transfer medium comprises an azeotrope of benzyl alcohol and water. While RR discloses systems using water with methanol, ethanol and isopropanol, benzyl alcohol is not discussed. RR discloses that the azeotrope is selected for compositional consistency with respect vis-à-vis compositional changes induced by evaporation. Doyel et al. teaches the interchangeability of ethanol, methanol, isopropanol and benzyl alcohol. Referring to water alcohol solvent mixtures Doyel et al. states "Among the most preferred are methanol, ethanol, isopropanol, and benzyl alcohol." The artisan would have been motivated to

make the instant combination for the reasons explicitly set forth in RR, namely a solvent that is relatively environmentally benign, residual free, and effective.

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

2. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gentle E. Winter whose telephone number is (571) 272-1310. The examiner can normally be reached on Monday-Friday 7:00-3:30.

4. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy P. Gulakowski can be reached on (571) 272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

5. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Questions on access to the Private PAIR system, should be directed to the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gentle E. Winter
Examiner
Art Unit 1746

April 26, 2004

RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700